

# Simulations of Unsteady Effects and Dynamic Responses in Complex Valve Systems, Phase I

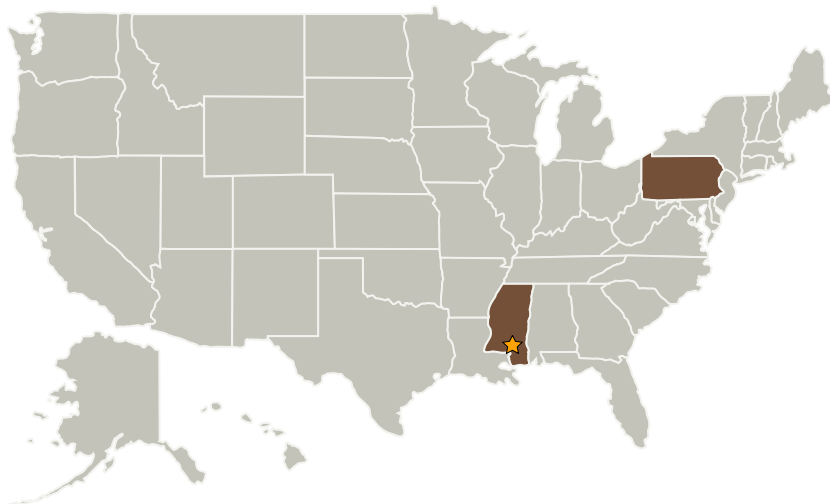
Completed Technology Project (2004 - 2005)



## Project Introduction

CFD based analyses are playing an increasingly important role in supporting experimental testing of rocket propulsion systems. The focus of this proposal is towards identifying and characterizing flow induced instabilities in the experimental test facility. Computational simulations will be carried out with advanced turbulence modeling extensions to the hybrid unstructured framework that has been previously shown to accurately and efficiently predict steady flowfields in complex valve configurations used at SSC. The computational framework will be comprehensive to include instabilities ranging from turbulent pressure fluctuations due to vortex shedding in bends and elbows of the piping system to large scale fluctuations due to collapse of vapor cavities in flow control elements such as venturis. Furthermore, the development in this proposal will include prediction of system response such as amplification and attenuation of dominant instability modes from coupling between components. In Phase II of the proposal development will focus on fluid structure interaction, structural vibrations and resonance. This will greatly enhance the current CFD technology utilized for performance analyses of valve and feed based systems and improve the ability to exert flow control, gauge system response, regulate pressure and suppress instabilities in rocket propulsion test facilities.

## Primary U.S. Work Locations and Key Partners



Simulations of Unsteady Effects and Dynamic Responses in Complex Valve Systems, Phase I

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Stennis Space Center (SSC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Simulations of Unsteady Effects and Dynamic Responses in Complex Valve Systems, Phase I

Completed Technology Project (2004 - 2005)



Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
CRAFT Tech - Combustion Research and Flow Technology	Supporting Organization	Industry	Pipersville, Pennsylvania

## Primary U.S. Work Locations

Mississippi	Pennsylvania
-------------	--------------

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Vineet Ahuja

## Technology Areas

**Primary:**

- TX15 Flight Vehicle Systems
  - └ TX15.1 Aerosciences
    - └ TX15.1.3 Aeroelasticity